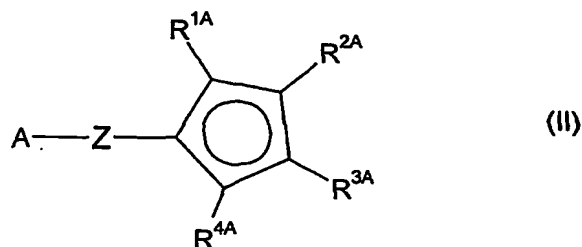


We claim:

1. A copolymer of ethylene with  $\alpha$ -olefins which has a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10 000 g/mol to 4 000 000 g/mol and a CDBI of less than 50% and in which the side chain branching of the maxima of the individual peaks of the side chain branching distribution is in each case greater than 5 CH<sub>2</sub>/1 000 carbon atoms.
2. A copolymer of ethylene with  $\alpha$ -olefins as claimed in claim 1 which has an at least bimodal side chain branching distribution.
3. A copolymer of ethylene with  $\alpha$ -olefins as claimed in claim 1 or 2 which has a molar mass  $M_n$  of from 150 000 g/mol to 1 000 000 g/mol.
4. A copolymer of ethylene with  $\alpha$ -olefins as claimed in any of claims 1 to 3 which has at least one peak in the Crystaf® spectrum of the differential distribution in the range from 15 to 40°C and at least one further peak in the Crystaf® spectrum of the differential distribution in the range from 25 to 80°C.
5. A copolymer of ethylene with  $\alpha$ -olefins as claimed in any of claims 2 to 4 in which the side chain branching distribution is bimodal or trimodal.
6. A process for preparing ethylene copolymers as claimed in any of claims 1 to 5, which comprises polymerizing ethylene with  $\alpha$ -olefins in the presence of the following components:
  - A) at least one monocyclopentadienyl complex comprising the structural feature of the formula (Cp-Z-A)Cr (I), where the variables have the following meanings:

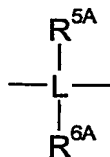
Cp-Z-A is a ligand of the formula (II)



where

$R^{1A}-R^{4A}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part,  $NR^{11A}_2$ ,  $N(SiR^{11A}_3)_2$ ,  $OR^{11A}$ ,  $OSiR^{11A}_3$ ,  $SiR^{11A}_3$ ,  $BR^{11A}_2$ , where the organic radicals  $R^{1A}-R^{4A}$  may also be substituted by halogens and where at least two of the vicinal radicals  $R^{1A}-R^{4A}$  are joined to form a five- or six-membered ring, and/or two vicinal radicals  $R^{1A}-R^{4A}$  are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S,

Z is a bridge between A and Cp having the formula



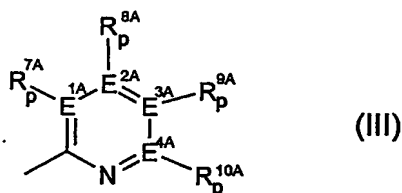
where

L is carbon or silicon, preferably carbon,

$R^{5A}, R^{6A}$  are each hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11A}_3$ , where the organic radicals  $R^{5A}$  and  $R^{6A}$  may also be substituted by halogens and  $R^{5A}$  and  $R^{6A}$  may also be joined to form a five- or six-membered ring,

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A is



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where

$E^{1A}-E^{4A}$  are each carbon or nitrogen,

$R^{7A}-R^{10A}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11A}_3$ , where the organic radicals  $R^{7A}-R^{10A}$  may also bear halogens or nitrogen or further  $C_1-C_{20}$ -alkyl groups,  $C_2-C_{20}$ -alkenyl groups,  $C_6-C_{20}$ -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11A}_3$  as substituents and two

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vicinal radicals  $R^{7A}-R^{10A}$  or  $R^{7A}$  and Z may also be joined to form a five- or six-membered ring,

5  $R^{11A}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals  $R^{11A}$  may also be joined to form a five- or six-membered ring and

10 p is 0 when  $E^{1A}-E^{4A}$  is nitrogen and is 1 when  $E^{1A}-E^{4A}$  is carbon,

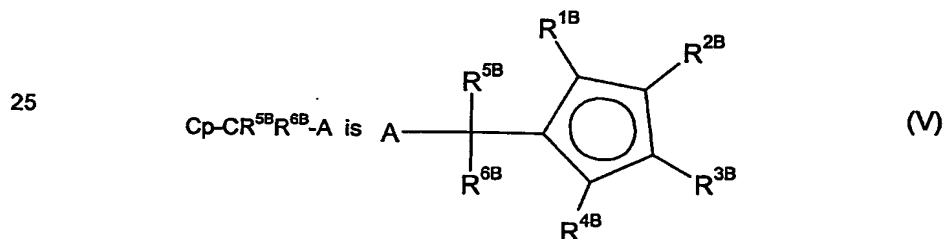
B) optionally an organic or inorganic support,

C) optionally one or more activating compounds and

15 D) optionally one or more metal compounds containing a metal of group 1, 2 or 13 of the Periodic Table.

7. A catalyst system for olefin polymerization comprising

20 A') at least one monocyclopentadienyl complex A') comprising the structural feature of the formula  $(Cp-CR^{5B}R^{6B}-A)Cr$  (IV), where the variables have the following meanings:

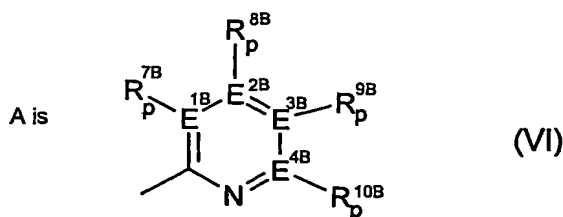


30 where

$R^{1B}-R^{4B}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical,  $NR^{5A}_2$ ,  $N(SiR^{11B}_3)_2$ ,  $OR^{11B}$ ,  $OSiR^{11B}_3$ ,  $SiR^{11B}_3$ ,  $BR^{11B}_2$ , where the organic radicals  $R^{1B}-R^{4B}$  may also be substituted by halogens and two vicinal radicals  $R^{1B}-R^{4B}$  may also be joined to form a five- or six-membered ring,

$R^{5B}, R^{6B}$  are each hydrogen or methyl,

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where  
 $E^{1B}-E^{4B}$  are each carbon or nitrogen,

$R^{7B}-R^{10B}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11B}_3$ , where the organic radicals  $R^{7B}-R^{10B}$  may also bear halogens or nitrogen or further  $C_1-C_{20}$ -alkyl groups,  $C_2-C_{20}$ -alkenyl groups,  $C_6-C_{20}$ -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11B}_3$  as substituents and two vicinal radicals  $R^{7B}-R^{10B}$  may also be joined to form a five- or six-membered ring,

$R^{11B}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals  $R^{11B}$  may also be joined to form a five- or six-membered ring,

$p$  is 0 when  $E^{1B}-E^{4B}$  is nitrogen and is 1 when  $E^{1B}-E^{4B}$  is carbon,

where at least one radical  $R^{7B}-R^{10B}$  is  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11B}_3$  and the organic radicals  $R^{7B}-R^{10B}$  may also bear halogens or nitrogen or further  $C_1-C_{20}$ -alkyl groups,  $C_2-C_{20}$ -alkenyl groups,  $C_6-C_{20}$ -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{5C}_3$  as substituents and two vicinal radicals  $R^{7B}-R^{10B}$  may also be joined to form a five- or six-membered ring or at least one  $E^{1B}-E^{4B}$  is nitrogen,

B) optionally an organic or inorganic support,

C) optionally one or more activating compounds and

D) optionally one or more metal compounds containing a metal of group 1, 2 or 13 of the Periodic Table.

8. A catalyst system for olefin polymerization as claimed in claim 7, wherein two vicinal radicals  $R^{1B}$ - $R^{4B}$  in the monocyclopentadienyl complex A') form a fused ring system.
- 5 9. A prepolymerized catalyst system comprising a catalyst system as claimed in claim 7 or 8 and linear  $C_2$ - $C_{10}$ -1-alkenes polymerized onto it in a mass ratio of from 1:0.1 to 1:200.
10. The use of a catalyst system as claimed in any of claims 7 to 9 for the polymerization or copolymerization of ethylene with  $\alpha$ -olefins.
- 10 11. A process for preparing ethylene copolymers as claimed in any of claims 1 to 4, which comprises polymerizing ethylene with  $\alpha$ -olefins in the presence of a catalyst system as claimed in any of claims 7 to 9.
- 15 12. A process as claimed in claim 11, wherein the polymerization is carried out using, as monomers, a monomer mixture which comprises ethylene and/or  $C_3$ - $C_{12}$ -1-alkenes and contains at least 50 mol% of ethylene.
- 20 13. A polymer mixture comprising  
(E) from 1 to 99% by weight of one or more ethylene copolymers as claimed in any of claims 1 to 5 and  
(F) from 1 to 99% by weight of a polymer which is different from (E),  
where the percentages by weight are based on the total mass of the polymer mixture.
- 25 14. A fiber, film or molding comprising an ethylene copolymer as claimed in any of claims 1 to 5.

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